

FORM C
Technical Requirements Matrix
RFP# 4509Z1

Req#	Requirement Description	Compliant	Non-Compliant	Prime/Subcontractor/ Third Party
A-1	The sample introduction systems must have the capability of accepting any of a variety of nebulizers such as standard cross-flow, V-groove, modified Babington, and concentric and low sample volume.			
	Response:			
A-2	Sample Introduction System. An integrated peristaltic pump shall be included as a part of the bid.			
	Response:			
A-3	The bid must include an ESI SC-4 DX with FAST system, or equivalent with a minimum of 4 rack capacity			
	Response:			
A-4	The bid must include the ESI PrepFAST system or equivalent. NPHEL will have the sole authority to determine equivalence of the autosampler.			
	Response:			
D-1	The instrument and any accessories supplied shall be computer controlled by a central desktop computer.			
	Response:			
D-2	The software controlling the instrument shall be a fully integrated package running under Microsoft Windows Seven.			
	Response:			
D-3	Vendor must provide software upgrades, at their expense, for a minimum of twelve years.			
	Response:			
D-4	Vendor will support new versions of Microsoft Windows, on current instrument, within eighteen months of new operating system release.			
	Response:			

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D-5	Vendors will be responsible for verifying that the computer and software are functionally compatible with the instrument and capable of transferring data to the Laboratory's Information Management System.			
	Response:			
D-6	Optimized settings for the system shall be stored in the computer and should be capable of being recalled at any time for rapid system setup.			
	Response			
D-7	The mass calibration shall be performed using a minimum of 5 points across the mass range meeting EPA requirements. The short term stability shall be less than 3%.			
	Response:			
D-8	<u>Data Processing and Operating System.</u> The data processing computer system must consist at a minimum of the following: PC with a minimum of 3.1 GHx, minimum of 4GB RAM, minimum 1 Tb hard drive, network adaptor, DVD-RW, Laser printer, minimum 22" monitor, keyboard, mouse, 3-year on-site warranty.			
	Response:			
D-9	The system shall be capable of being connected to the NPHEL LAN network with current NPHEL log on protocols			
	Response:			
D-10	All instrument and operating system software must operate under Microsoft Windows Seven and this software and the operating system software must be included as part of the bid.			
	Response:			

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D-11	Microsoft Office Professional must also be included, along with any software or hardware that is needed for remote diagnosis of system problems from the instrument manufacturer's service facility.			
	Response:			
D-12	The instrument software must be fully-integrated, which will allow the user to simultaneously analyze samples as well as transferring data to NPHEL's LIMS; update sample databases, either current samples running or previously run samples; enter new autosampler tables or operate other software to increase productivity.			
	Response:			
D-13	The software must monitor and control all instrument devices and instrument parameters.			
	Response:			
D-14	If a malfunction occurs an error file must be recorded with a clear message displayed to alert the operator.			
	Response:			
D-15	The software must have the capability of transferring data through the Laboratory's server to NPHEL's LIMS and any additional software which might be required to accomplish this must be included as a part of the bid.			
	Response:			
D-16	The software must also be capable of transferring the analytical run electronically.			
	Response:			
D-17	Any file structure or software needed to transfer to either of the Laboratory's data management system must be included.			
	Response:			
D-18	The software system must include the ability to display parameters and instrument response in real time.			
	Response:			

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D-19	The system must also meet EPA audit trail and encryption protocols.			
	Response:			
D-20	The calibration of the instrument must be operator selectable from linear to second order polynomial with weighting factors, and allow different analytical methods ranging from fully quantitative, semi-quantitative, isotope ratio, and isotope dilution.			
	Response:			
D-21	The software must be capable of acquiring and processing data from three modes of acquisition; scanning, peak jumping, and split scanning with variable integration times.			
	Response:			
D-22	In scanning modes, the software must provide full spectral information (including identification of minor and major peaks adjacent to major mass lines), and provide the ability to identify elements from transient signals.			
	Response:			
D-23	The system must have the ability to acquire data in all previously mentioned modes which utilize cell technology.			
	Response:			
D-24	Help files must be included in the software to assist the operator without reference to the operations manual.			
	Response:			
G-1	The ICP-MS shall have the capability to meet and perform all of the criteria as set forth in EPA 200.8			
	Response:			
G-2	The system must be capable of operating in a standard laboratory environment under a wide range of temperatures and relative humidity, and must not require special power conditioning or air conditioning.			
	Response:			

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G-3	Vendor must supply the temperature and humidity ranges that their instrument can operate in.			
	Response:			
G-4	If the instrument requires a special plug, it shall be provided by the vendor.			
	Response:			
G-5	The instrument must be capable of automatically being turned on and turned off following the completion of an analytical run.			
	Response:			
G-6	The vendor must provide name and contact information for a minimum of 3 clients using the instrument as bid, analyzing samples by EPA Method 200.8.			
	Response:			
G-7	The selected vendor shall provide a minimum of 3 days training on-site or 3 days of tuition-free training on the instrument selected at the vendor manufacturing facility for two members of NPHEL's analytical staff.			
	Response:			
G-8	If training is done at the vendor facility, the training package must include round-trip air transportation, all ground transportation, and hotel accommodations for the selected staff members while they attend the training sessions.			
	Response:			
G-9	The vendor must be willing to demonstrate the ability to meet these specifications of the instrumentation bid prior to the award of bid and after the closing date.			
	Response:			

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G-10	The vendor shall set up the instrument as bid at the NPHEL facility and allow NPHEL staff to analyze samples to demonstrate its functionality.			
	Response:			
G-11	The vendor shall provide the NPHEL staff access to the same base unit as bid at a site within reasonable driving distance (100 miles) of the NPHEL facility so that the NPHEL staff can either analyze demonstration samples or have the demonstration location operator analyze the samples.			
	Response:			
G-12	If the vendor does not have access to a instrument within reasonable driving distance or is unable to set up an instrument at the NPHEL facility, the vendor shall provide all transportation and lodging (if necessary) for two (2) members of the NPHEL analytical staff to a site of the vendor's choice where the instrument may be examined and demonstration samples are analyzed. NPHEL staff members shall have access to the instrument for a minimum of two (2) days.			
	Response:			
G-13	All items must be considered new and shall conform in quality and workmanship to what is specified			
	Response:			
G-14	The instrument bid shall be the latest current model of proven performance and under standard production by the manufacturer and is to be of standard design, complete as regularly advertised and marketed including all specified accessories, tools and special features.			
	Response:			

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G-15	All necessary parts for satisfactory operation of the equipment shall be furnished.			
	Response:			
I-1	The ICP-MS must be a bench-top design			
	Response:			
I-2	The ICP-MS and autosampler must occupy no more than 54 inches wide x 30 inches deep.			
	Response:			
I-3	All connections, gas, power, air filters and water supplies must be accessible from the sides or front of the instrument. Routine service and maintenance should not need to access the rear of the instrument.			
	Response:			
I-4	The ICP-MS system must have a plasma view window or a way to remotely view the plasma torch.			
	Response:			
I-5	The system must be capable of operating in Standard Mode and Collision Cell Mode with KED and to be able to run by both modes within the same sample acquisition if required.			
	Response:			
I-6	The collision cell must be capable of utilizing reactive gases such as hydrogen, ammonia and oxygen.			
	Response:			
I-7	The collision cell must be able to apply such reactive gases in mixtures diluted with helium.			
	Response:			

Req#	Requirement Description	Compliant	Non-Compliant	Prime/Subcontractor/ Third Party																																																
I-8	<div>The ICP-MS shall have the capability to attain instrument detection limits at or lower than those listed below using normal analysis techniques and under normal operating conditions without using collision or reaction cell technology (IDL's in µg/L):</div> <table><tr><td>Aluminum</td><td>0.007</td><td>Manganese</td><td>0.002</td></tr><tr><td>Antimony</td><td>0.002</td><td>Molybdenum</td><td>0.003</td></tr><tr><td>Arsenic</td><td>0.06</td><td>Nickel</td><td>0.004</td></tr><tr><td>Barium</td><td>0.008</td><td>Selenium</td><td>0.015</td></tr><tr><td>Beryllium</td><td>0.008</td><td>Silver</td><td>0.002</td></tr><tr><td>Cadmium</td><td>0.02</td><td>Thallium</td><td>0.0004</td></tr><tr><td>Chromium</td><td>0.05</td><td>Thorium</td><td>0.001</td></tr><tr><td>Cobalt</td><td>0.001</td><td>Uranium</td><td>0.0003</td></tr><tr><td>Copper</td><td>0.005</td><td>Vanadium</td><td>0.02</td></tr><tr><td>Lead</td><td>0.004</td><td>Zinc</td><td>0.02</td></tr><tr><td>Mercury</td><td>0.02</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	Aluminum	0.007	Manganese	0.002	Antimony	0.002	Molybdenum	0.003	Arsenic	0.06	Nickel	0.004	Barium	0.008	Selenium	0.015	Beryllium	0.008	Silver	0.002	Cadmium	0.02	Thallium	0.0004	Chromium	0.05	Thorium	0.001	Cobalt	0.001	Uranium	0.0003	Copper	0.005	Vanadium	0.02	Lead	0.004	Zinc	0.02	Mercury	0.02									
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I-9	The torch, gases, interface water, and peristaltic pump shall be automatically turned on and off.																																																			
	Response:																																																			
I-10	Sufficient analytical sensitivity must be shown through the measurement of a suite of elements in a single method.																																																			
	Response:																																																			

Req#	Requirement Description	Compliant	Non-Compliant	Prime/Subcontractor/Third Party												
I-11	<p>Instrument performance shall be guaranteed to the following minimum values for the elements listed (counts per second per ppb, single peak measurement at a single mass) while maintaining background noise at <1 cps and the CeO⁺:Ce⁺ ratio at less than 2%:</p> <table><tr><td>Beryllium</td><td>500,000 cps/ppb</td></tr><tr><td>Magnesium</td><td>4,000,000 cps/ppb</td></tr><tr><td>Indium¹¹⁵</td><td>220,000 cps/ppb</td></tr><tr><td>Uranium</td><td>300,000 cps/ppb</td></tr><tr><td>Cobalt⁵⁹</td><td>100,000 cps/ppb</td></tr><tr><td>Lithium⁷</td><td>50,000 cps/ppb</td></tr></table>	Beryllium	500,000 cps/ppb	Magnesium	4,000,000 cps/ppb	Indium ¹¹⁵	220,000 cps/ppb	Uranium	300,000 cps/ppb	Cobalt ⁵⁹	100,000 cps/ppb	Lithium ⁷	50,000 cps/ppb			
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	Response:															
I-12	<p>The short-term precision of the instrument, in terms of relative standard deviation, must be shown to be typically better than 2% for 10 consecutive one minute acquisitions for Be, Co, In, Pb, and U, at a concentration of 10 ppb in either peak jumping or scanning modes.</p>															
	Response:															
I-13	<p>The concentration of any sample analyte must be shown to fall from the 8th order of magnitude using the standard introduction system and normal samples preserved with 1% nitric acid to within 0.01% of the measured analyte signal within 120 seconds after completion of aqueous sample aspiration.</p>															
	Response:															
I-14	<p>The instrument must show a uniform background count across the mass range and should typically be less than 1 cps measured at masses theoretically void of analyte signal (i.e. mass 5 and 220).</p>															
	Response:															

Req#	Requirement Description	Compliant	Non-Compliant	Prime/Subcontractor/Third Party										
I-15	The background in cell mode shall be < 2 cps at mass 50.5.													
	Response:													
I-16	Under standard operating conditions, resolution shall be 0.8 amu at 10% peak height across the mass range or better													
	Response:													
I-17	It shall be shown that the instrument and software can automatically tune the instrument for maximum signal with minimum oxide formation and doubly charged ion formation. The measured oxide and doubly charged ions ratios should be at or below the following: <table><tr><td>Barium (M⁺⁺/M⁺)</td><td><0.03</td></tr><tr><td>Cerium (M⁺⁺/M⁺)</td><td><0.02</td></tr><tr><td>Barium (MO⁺/M⁺)</td><td><0.002</td></tr><tr><td>Cerium (MO⁺/M⁺)</td><td><0.015</td></tr><tr><td>Lanthanum (MO⁺/M⁺)</td><td><0.01</td></tr></table>	Barium (M ⁺⁺ /M ⁺)	<0.03	Cerium (M ⁺⁺ /M ⁺)	<0.02	Barium (MO ⁺ /M ⁺)	<0.002	Cerium (MO ⁺ /M ⁺)	<0.015	Lanthanum (MO ⁺ /M ⁺)	<0.01			
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	Response:													
I-18	These oxide and doubly charged specifications shall be attainable, in the same run, with the use of a chilled spray chamber.													
	Response:													
I-19	The high frequency power supply shall be at a frequency of either 27 or 40 MHz free-running power supplies.													
	Response:													
I-20	The power supply shall be fully computer controlled capable of variable power output from 500 to 1600 Watts.													
	Response:													

Req#	Requirement Description	Compliant	Non-Compliant	Prime/Subcontractor/Third Party
I-21	The power output shall be under complete computer control including on/off with forward and reflected power displayed, and allow automatic switching from cold plasma conditions to hot plasma conditions automatically during an analysis.			
	Response:			
I-22	Shields or screens shall not be needed for any modes of operation including collision cell or reaction cell operation.			
	Response:			
I-23	The RF load coil shall be easily removed and ideally not require water cooling.			
	Response:			
I-24	Plasma ignition and shutdown shall be accomplished with a single mouse click.			
	Response:			
I-25	A water-cooled interface shall be used with a skimmer cone of minimum orifice size of 0.9 mm to give the system a high tolerance for dissolved solids and minimize clogging			
	Response:			
I-26	The system shall also automatically backfill with an inert gas in the event of any unexpected power failure.			
	Response:			
I-27	The system shall be capable of analyzing samples by scanning from mass 4 to 260 or by peak jumping between masses with one to 20 or more channels per peak.			
	Response:			
I-28	The system shall be capable of changing from standard non-cell conditions to cell condition within the same analytical run.			
	Response:			

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I-29	The quadrupole and RF generator electronics shall provide a mass calibration stability of less than 0.05 amu across the mass range per day without requiring water cooling.			
	Response:			
I-30	The high frequency power supplies shall conform to all Federal Communications Commission (FCC) regulation			
	Response:			
M-1	System bid must include a minimum of <u>two sets</u> of nickel sampling cones.			
	Response:			
M-2	The system shall include two standard quartz torches and/or two torch assemblies.			
	Response:			
M-3	One standard nebulizer for use with clean water (i.e.< 2% dissolved solids), and one nebulizer for use with high dissolved solids samples shall be included as a part of the bid.			
	Response:			
M-4	All meters, control circuits, and interlocks necessary for the safe operation, adjustment and routine maintenance of the instrument must be provided including any special regulator (s) which are needed for any special gases that might be required other than the standard argon gas.			
	Response:			
M-5	Controls shall not interact in any complicated manner so that the adjustment of one disturbs the other, except as might be a logical sequence of events required for alignment or adjustments having normal dependence on one another.			
	Response:			

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M-6	The instrument shall be fully interlocked for operational simplicity, complete operator safety, and full protection of the instrument against damage, except for the torch itself			
	Response:			
M-7	The instrument shall be installed to operational condition and demonstrated to be acceptable prior the completion of the installation.			
	Response:			
M-8	A calibrated method using EPA Method 200.8 shall be operational on the instrument upon completion of the installation.			
	Response:			
M-9	The instrument and all components shall conform to Occupational Safety and Health Agency (OSHA) regulations			
	Response:			
M-10	Operation and maintenance manuals, software listing, and full documentation and manual for graphics, telecommunications, spreadsheet, wordprocessor, and data manager software shall be provided.			
	Response:			
S-1	The linear dynamic range of the instrument shall be at least 8 orders of magnitude.			
	Response:			
S-2	This range must be demonstrated during training to NPHEL based on samples provided and achieved upon a single sample injection across the entire mass range 4-260 amu without any prior characterization of the sample.			
	Response:			

Req#	Requirement Description	Compliant	Non-Compliant	Prime/Subcontractor/Third Party
S-3	If a cross calibration is used across analog and pulse counting modes of the detector it shall be shown to be linear across the orders of magnitude.			
	Response:			
S-4	The mass spectrometer portion of this instrument shall consist of a minimum of two turbomolecular pumps and two rotary or ruffing pumps, ion lens, quadrupole and detector.			
	Response:			
S-5	Normal working operating vacuum must be guaranteed to be at least 1×10^{-6} torr ($\sqrt{2} \times 10^{-6}$ torr). The system should be equipped with interface gate valves to ensure vacuum integrity during maintenance and should be capable of automatically shutting valves and safety systems to ensure proper shutdown of turbomolecular pumps in the event of a power outage.			
	Response:			
S-6	The entire vacuum system shall be fully controlled and monitored at the computer for start-up and shutdown procedures			
S-7	The instrument must be equipped with a collision and reaction cell capable of introducing various gases, both inert and corrosive.			
	Response:			
S-8	The cell gases shall be fully computer controlled and adjustable between masses and capable of introducing two different gasses in the same run.			
	Response:			
S-9	Mass flow controller shall be employed to control gas feed rates.			
	Response:			

Req#	Requirement Description	Compliant	Non-Compliant	Prime/Subcontractor/Third Party
S-10	The cell shall be a mass filter using either a quadrupole or hexapole design.			
	Response:			
S-11	The detector shall be a discrete dynode electron multiplier that will simultaneously measure pulse-counting signals and analog signals and must have a linear dynamic range of eight orders of magnitude.			
	Response:			
S-12	The detector shall be fully protected against damage due to over range signals and high ion flux.			
	Response:			
S-13	Under normal conditions the detector shall be capable of maintaining good acceptable performance for a minimal of 1 year or be included as a part of the bid.			
	Response:			
W-1	The selected vendor must provide a warranty on the entire system and all components (including the computer system) for a minimum of one (1) year.			
	Response:			
W-2	The warranty shall cover all parts, labor, travel, and service.			
	Response:			
W-3	Warranty shall begin after the system is installed and operating and when NPHEL informs the selected vendor in writing that the system meets all the specifications required under this request for quotation.			
	Response:			
W-4	This warranty shall also apply to any part of the system that is supplied by a third party vendor.			
	Response:			